UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/500,461	07/14/2004	Ito Tomoyoshi	255887US2pct	4571

22850 7590 04/30/2009

OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER	
CHANG, AUDREY Y	

ART UNIT	PAPER NUMBER
2872	

NOTIFICATION DATE	DELIVERY MODE
04/30/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com
oblonpat@oblon.com
jgardner@oblon.com

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/500,461
Filing Date: July 14, 2004
Appellant(s): TOMOYOSHI, ITO

Ronald A. Rudder
Reg. No. 45,618
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed January 21, 2009 appealing from the Office action mailed April 22, 2008.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is substantially correct. The changes are as follows: Claims 12 and 13 are rejected under 35 USC 103(a) (not 102(a)) as being unpatentable over Kato et al, Sekiguchi et al, Popovich et al and Eichenlaub in view of Fukagawa et al and Ohno.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,852,504	KATO et al	12-1998
5,798,864	SEKIGUCHI	8-1998
6,115,152	POPOVICH et al	9-2000

5,410,345	EICHENLAUB	4-1995
6,510,446	FUKAGAWA	1-2003
6,232,940	OHNO et al	5-2001

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 7 and 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Kato et al (PN. 5,852,504) in view of the patents issued to Sekiguchi et al (PN. 5,798,864), Popovich et al (PN. 6,115,152) and Eichenlaub (PN.5,410,345).

Kato et al teaches a *holographic image display* that is comprised of a *computer* for calculating phase information from three dimensional coordinate data of *objects* (Figures 1-2) to create *computer generated hologram fringe information* wherein the phase information or computer generated holographic fringe information is provided by a *controller* (138, Figure 28) to a ***reflective*** *spatial light modulator* (130, **Figure 28**) such as a *liquid crystal display device*, (Figure 26, column 12, lines 7-10) to display the computer generated holographic *fringe* information on the ***reflective*** liquid crystal display device, (please see column 12, lines 49 to column 13, line 4).

The data of the three-dimensional object used for creating the computer-generated hologram is externally obtained, (please see Figures 1-2 and 6-7 and the explicit teachings of using CCD camera to

obtain the image data of the three dimensional object, column 5, lines 36-40). The controller also serves as the computer for computing the hologram of the phase distribution is connected to the reflective liquid crystal display, (please see Figure 28, also column 12, lines 45-56).

Kato et al teaches that a *semiconductor laser light source* (134, please see column 11, lines 40-42) is used to illuminating the reflective liquid crystal display **via** a *half mirror* (142) such that a three dimensional image of the objects, (objects used for calculating the computer generated holographic fringe information) is reconstructed from the reflective liquid crystal display device and is *projected* by the *half mirror* to an observer, (please see Figure 28, columns 11-12).

This reference has met all the limitations of the claims with the exception that it does not teach *explicitly* that the light sources are three light emitting diodes of primary colors red, green and blue. **Kato et al** does teach a *full color display* wherein three light sources each generating one primary color of light are being used to illuminate the display *at same time*, (please see Figure 36 of Kato et al and column 11, lines 44-53 and column 14, lines 36-46). **Kato** et al teaches that the light sources are *semiconductor laser* but does not teach explicitly that the semiconductor laser light sources are light emitting diodes. But one skilled in the art would understand that a semiconductor laser **is one type of** a *light emitting diode light sources* for they all based on same semiconductor p-n junction structure for emitting the light. **Popovich** et al in the same field of endeavor also teaches that either laser diode (semiconductor laser) or light emitting diodes, (LEDs) can be used to illuminate a reflective holographic display to provide the reconstructed full color holographic image, (please see column 21, line 28 to column 22, line 6). It would then have been obvious to one skilled in the art to apply the teachings of **Popovich** et al to modify the display device of **Kato** et al to use high power LEDs as the light sources for producing the full color images for the benefit of using bright light sources with high output power and narrow bandwidth to improve the image quality.

These references however do not teach explicitly that the *"LEDs arranged on a two dimensional grid pattern ... wherein a first LED of the R, G, and B LEDs is disposed in the vicinity of a second LED in the horizontal direction and a third LED is disposed in the vicinity of the second LED in the vertical direction orthogonal to the horizontal direction"*. **Kato** et al teaches in a different embodiment (Figure 36) for providing full color display wherein the three light sources, (for generating red, blue and green light respectively), are arranged in a two-dimensional array manner, (please see Figure 36) each with an associated spatial light modulators. One skilled in the art would understand in order for each of the light beam to illuminate the spatial light modulator (SLM, 200, 202, 204, Figure 36), arranged in *two dimensional manner*, the light sources have to be arranged also in two dimensional manner, (i.e. the semiconductor light sources (206, 208, 210) have to be **aligned** with the optical axes of the SLM respectively), since the collimating light beams from the three light sources will not be able to change the direction by themselves or by SLM to form the orthogonal arranged light beams as they incident on the half mirror. Furthermore, it is known in the art to use three primary color lights to illuminate the liquid crystal display device to produce full color display. As demonstrated by **Eichenlaub** in a full color image display arrangement, light sources with red LED (174, Figure 13), green LED (175) and blue LED (176 and/or 177) are arranged in a *two dimensional grid pattern* with first LED (such as the blue LED, 177) at vicinity of the second LEDs (green LED 176) in the horizontal direction and a third LED (red LED 174) is at the vicinity of the second LED (green LED 176) at vertical direction, so that the light emitting diodes for the three primary color can be used to illuminate a *corresponding* pixel of the liquid crystal display to produce the full color image display, (please see Figure 13, column 12, lines 49-65). It would then have been obvious to one skilled in the art to arrange the three color light sources in a grid pattern as the light source (134, Figure 28) for Kato et al that match the pixels on the reflective liquid crystal display for the benefit of using a *single* LCD display to provide full color holographic image display with a more compact arrangement and design. The optical axes of the color beams from LEDs (Figure 13 of

Eichenlaub) are shifted from each other and the light beams from the LEDs in combination with the arrangement of Figure 28 of Kato et al will project to the half mirror (142) and onto the reflective liquid crystal display (130) to reproduce a color holographic image from the computer generated hologram displayed on the LCD display. As taught by **Popovich** et al that the red, green and blue LEDs can simultaneously illuminate the reflective holographic display to provide the full color holographic image, (Figure 19 of Popovich et al).

With regard to claim 10, the Kato et al reference however does not teach explicitly to use a pinhole filter and a collimator lens disposed between the light source and the half mirror. But this reference does teach that *collimated* light is used to illuminate the liquid crystal display device. **Kato** et al in a different embodiment teaches that a *pinhole filter* (for creating point light source) and a *collimator lens* (216 or 218, Figure 35) can be used to create *collimated illumination* light beam to illuminate the liquid crystal display device. **Sekiguchi** in the same field of endeavor also teaches to use *pinhole filter* and *collimator lens* (202a, Figure 9) between the laser light source and the half mirror for creating *collimated illumination light beam* for illuminating the display device, for displaying a computer generated Fraunhofer diffraction image (which can be one form of computer generated holographic image). It would then have been obvious to one skilled in the art to apply the teachings of Kato et al and Sekiguchi to modify the holographic image display device of Kato et al to use pinhole filter and collimator lens to *effectively* create the *collimated* illumination beams needed.

With regard to claim 11, it is implicitly true that the size of reconstruction area which is the size of illumination areas of the light sources is determined by the geometric relationship between the distances between each individual light color light source, pinhole filter, the collimator lens, the display device and the field lens. The distances between the individual light source determines the size of the light field. The light field propagates through the pinhole filter, the collimator lens, the display device and the field lens to form the reconstructed image which has reconstructed image area.

Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patents issued to Kato et al, Sekiguchi et al, Popovich et al and Eichenlaub (PN.5,410,345) as applied to claim 7 above, and further in view of the patents issued to Fukagawa (PN. 6,510,446) and Ohno (PN. 6,232,940).

The holographic image reproducing device taught by Kato et al in view of the teachings of Sekiguchi et al, Popovich et al and Eichenlaub as described for claim 7 above have met all the limitations of the claims.

Claims 12 and 13 recite a “dedicated high-speed parallel distributed processing system" and " a plurality of dedicated Large Scale Integrator LSIs”, but fail to provide the logical relationships of these elements with the holographic reproducing device. *These elements are therefore being examined as data processing element and liquid crystal driving circuit.* Kato et al teaches to use computer for processing and calculate computer hologram data but it does not teach explicitly to use the claimed processor. **Fukagawa** teaches that a dedicated high speed data calculation processor can be used to calculate image data, (please see column 16, lines 49-52). The dedicated high speed data calculation processor includes a memory (320, Figure 28). Kato et al teaches that the display is a liquid crystal display device but does not teach explicitly that it is controlled and driven by a plurality of LSIs. **Ohno** in the same field of endeavor teach that a **standard** liquid crystal display device is driven by having a plurality of parallel LSIs (21-23, Figure 6, please see column 6, lines 44-53) with a *shared memory* , (20a, Figure 4). It would then have been obvious to one skilled in the art to apply the teachings of Fukagawa et al and Ohno to adopt the dedicated high speed processor to process the image data and to use standard LCD display with the plurality of LSIs to improve the data processing speed and to (if is not already implicitly included) improve the drive control of the liquid crystal display device for obtaining better image quality. Noted the parallel LSIs (21-23, Figure 6) are to drive the liquid crystal display (1) and the data is transferred via

the parallel LSIs to the liquid crystal display (1, Figure 5), this means it has to be between the computer for providing the data and the liquid crystal display device.

(10) Response to Argument

A. Regarding the 35 USC 103 Rejection of Claims 7 and 10-11

In response to appellant's arguments which state that the secondary reference Eichenlaub is drawn to stereoscopic display device which is non-analogues or "totally different" from holographic technique therefore cannot be reasonably pertinent to the problem concerning a color moving-image holographic reproducing device, the examiner respectfully disagrees. It has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, Eichenlaub is relied upon to provide the teachings concerning the use of LEDs light sources of primary colors to illuminate a liquid crystal display device with image information displayed to provide full color image to an observer. Since both the cited Kato et al reference (i.e. the primary reference) and the instant application use primary color light sources to illuminate a liquid crystal display device with image information, such as the computer generated hologram, to display a full-color image, the technique of *displaying image* using LCD display **not** the stereoscopic technique taught by Eichenlaub certainly is reasonably pertinent to one skilled in the art to facilitate the full color display of the image. The image display using LEDs light sources and the liquid crystal display device taught by Eichenlaub, which is independent from both holography and stereoscopic technologies, is a *shared* technique for *both* stereoscopic image display and the holographic image display, therefore is relevant and can be used as a basis for the rejections of the claimed invention.

Appellant's arguments based on evidence cited in the appendix (Article A) is noted, however the article does not explain why the image displaying technique using LEDs light source and liquid crystal display device cannot be utilized in both the stereoscopic image display system and the holographic image display system.

In response to appellant's **first** argument, stated in appeal brief pages 8-9, which states that it *only* have been obvious in the stereoscopic imaging liquid crystal technique of Eichenlaub to arrange the three primary color LEDs light sources in the grid pattern, the examiner respectfully disagrees for the reasons stated below. The grid arrangement of the three color LEDs for illuminating the liquid crystal display device for providing full color image taught by Eichenlaub *is not only* limited to stereoscopic image display and it is common to *any* full color image display using liquid crystal display device. The arrangement of the LEDs and liquid crystal display does not rely upon any particular stereoscopic image display technique. By having grid pattern LEDs and the liquid crystal display device *alone* will not be able to provide stereoscopic image display. Other criterions not involving the grid patterns of LEDs light sources are required to provide stereoscopic image display. The appellant is correct in identifying that full color image display can only achieved by *fusing* red, blue and green color images together, both Kato et al reference (Figure 36) and Eichenlaub teaches such explicitly. Kato et al teaches to use three color light sources each with a spatial light modulator to form red, green and blue color images and to fuse them together by the series of half mirrors (220, and 222) to form fused full color image to the observer. Eichenlaub teaches to have the grid patterned LEDs color light sources (174-177, Figure 13) to illuminate the liquid crystal display to form red, green and blue color images and fuse together to form full color image, (please see Eichenlaub column 12, lines 45-48 and the appeal brief page 8, second paragraph line5). This provides the basis for the combination of teachings of Eichenlaub to modify the light source of (134, Figure 28) of Kato et al to make it comprises grid patterned three color light sources, to illuminate the *reflective* liquid crystal display to provide full color holographic image for the benefit of

reducing the number of liquid crystal display devices used and therefore the size of the display system. The modification certainly is obvious to one skilled in the art and one skilled in the art certainly will be motivated to combine the teachings of Eichenlaub to modify the display system of Kato et al.

In regard to appellant's arguments concerning that the three color light sources shown in Figure 36 of Kato et al has to be linear not form a two-dimensional grid, the examiner respectfully disagrees for the reasons stated below. Firstly, one skilled in the art having basic optical knowledge would know that the collimated light beam from the light sources illuminate the spatial light modulators (200, 202 and 204) will not be bended by the spatial light modulators since spatial light modulator normally does not have light refraction or bending property. Secondly, Kato et al reference in Figures 26-28, teaches the reproducing light (light generated by the light source (134) incidents on the spatial light modulator or the liquid crystal display *normally* or *perpendicularly*, this suggests that light beams from the light sources incident on the spatial light modulators perpendicularly or with normal incident angle. This means the light sources should be placed normally in aligned with each spatial light modulator to provide normal incidence of the reproducing light. This suggests the three light sources are arranged in grid or two dimensional pattern since the three spatial light modulators (200, 202 and 204, Figure 36) are arranged in two dimensional grid pattern.

In response to appellant's **second** argument, (appeal brief page 9, third paragraph), which states that Eichenlaub teaches that the LEDs light sources are turned on/off in synchronization which therefore differs from the instant application recites that the three LEDs light sources illuminate light at the same time and therefore teaches away from the instant application, the examiner respectfully disagrees. Firstly, the *scopes* of the claims is to provide full color image by using the three color light sources so that the three color image lights is arranged to be fused by human vision to form full color image and then visualized. This means the three color images have to be received by the observer *essentially* at the same time. Kato et al in Figure 36, shows that three color light beams are emitting light at same time to achieve

full color image display. Since Eichenlaub teaches explicitly that the three color lights are *fused* by vision of the observer, (please see column 12, lines 45-50), this means the three colors light images essentially reach the observer's eye at the same time. The so-called on/off synchronization is achieved without the observer to notice any time difference between the different color image lights and it has to be done within the flicker fusion rate of human eye. For otherwise individually distinct color images **not** the fused full color image will be observed. The LEDs light sources of Eichenlaub are *essentially* emitting color lights at the *same* time, as far as the observer is concerned. Since the light emission function of LEDs light sources of Eichenlaub achieves the ***same*** function and result as of the light emission function of LEDs light sources of the instant application, namely to provide full color image, there is no patently distinct or unexpected result between the two systems. Furthermore, Popovich et al in Figure 19, explicitly shows that the three primary color LEDs can be activated to *illuminate* light at the same time to reproduce the full color holographic image. To have the three color LEDs emitting the light at the same time or not (but within the human vision limitation to notice the difference) therefore does not provide any patentably different result, they are therefore considered to be obvious matters of design choice to one skilled in the art.

In response to appellant's **third** argument, (appeal brief page 9, last paragraph to page 10), which state the "light emitting elements in Eichenlaub can be considered to function differently than in the light emitting element in the claimed combination" the examiner respectfully disagrees. Firstly, the appellant fails to explain *how* the light emitting elements in Eichenlaub function differently than the light emitting element in the claimed combination, the examiner can only response this argument with broadest interpretation. The light emitting elements of Eichenlaub essentially emit light at the same time as far as the human vision concern (for the reasons stated in the response to second argument above), and it does not function differently from the light emitting elements of the instant application in the claimed combination since they *both* illuminate the liquid crystal display device to provide full color image.

Therefore there is no different function or unexpected result for the light emitting elements of Eichenlaub and the instant application.

Hence for the reasons stated above the cited Eichenlaub reference is not analogous rather is totally relevant to be relied upon to provide the teachings that would motivate one skilled in the art to modify the display system of Kato et al to use the grid pattern primary color light emitting elements to illuminate the liquid crystal display to provide full color holographic image display for the purpose of providing compact image display arrangement. The light emitting elements of Eichenlaub also do not function differently or patently distinct from the light emitting elements of the instant application in the claimed combination, sine they both provide full color image.

The rejection of claims 7, and 10-11 under 35 USC 103(a) therefore still holds.

B. Regarding the 35 USC 103 Rejection of Claims 12 and 13

In response to appellant's argument which state that the reasons of rejection fails to consider the Large Scale Integrator (LSIs) are between the computer and the reflective liquid crystal display, the examiner respectfully disagrees for the reasons stated below. Ohno reference teaches that the parallel LSIs (21-23, Figure 6) are to *drive* the liquid crystal display (1) and the *data* is transferred via the parallel LSIs to the liquid crystal display (1, Figure 5), this means it has to be *between* the computer for providing the data and the liquid crystal display device. The primary reference Kato et al teaches explicitly that the controller or the computer (138, Figure 28) calculates the hologram of the phase information and transfers the information to the reflective liquid crystal display device (130, please see Figure 28 and column 12, lines 52-56). This means the parallel LSIs, that transfer data to and drive the liquid crystal display deice, *has* to be between the computer (138) and the reflective liquid crystal display device (130). One skilled in the art would therefore have been motivated to combine the teachings of Fukagawa et al and Ohno to adopt the dedicated high speed processor to process the image data and to use standard LCD display with

the plurality of LSIs to improve the data processing speed and to improve the drive control of the liquid crystal display device for obtaining better image quality

The rejection of claims 12 and 13 under 35 USC 103 therefore still holds.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

(12) Evidence Appendix

The reference article "Emerging 3D Display Technologies, holographic 3D, Volumetric 3D and Spatial 3D Display" is noted.

Conferees:

Darren Schuberg
/Darren Schuberg/
TQAS TC 2800

Stephone B. Allen
/Stephone B. Allen/
Supervisory Patent Examiner, Art Unit 2872

Audrey Y, Chang, Ph.D.
/Audrey Y. Chang/
Primary Examiner, Art Unit 2872